RADIO TECHNOLOGIES AND SPECTRUM PERSPECTIVES

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MOBILE COVERAGE IN APAC

By 2017

- 90 percent of the population in APAC will be covered by 3G
- 60 percent of the APAC population will be covered by LTE

[Bar chart showing population coverage for GSM/EDGE, WCDMA/HSPA, and LTE from 2011 to 2017.]

Source: Ericsson (2012)
MOBILE DATA TRAFFIC DOUBLED AGAIN

- Mobile data traffic doubled between Q3 2011 and Q3 2012
- Voice increase due to new subscriptions

14x

MOBILE DATA TRAFFIC FOR SMARTPHONES WILL GROW ~14 TIMES BETWEEN 2012 AND 2018

Source: Ericsson (2012)
## ECONOMIES OF SCALE
- LOWER SMARTPHONE PRICES DRIVING ADOPTION

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
<th>Speed</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moto XT300</td>
<td>$66</td>
<td>7.2Mbps</td>
<td>2100Mhz</td>
</tr>
<tr>
<td>Moto XT316</td>
<td>$60</td>
<td>7.2Mbps</td>
<td>2100Mhz</td>
</tr>
<tr>
<td>Samsung I5508</td>
<td>$78</td>
<td>7.2Mbps</td>
<td>2100Mhz</td>
</tr>
<tr>
<td>Small Pepper</td>
<td>$110</td>
<td>Dual Core</td>
<td></td>
</tr>
<tr>
<td>ZTE V889D</td>
<td>$110</td>
<td>CPU 1Ghz</td>
<td>dual SIM</td>
</tr>
<tr>
<td>Moto XT390</td>
<td>$105</td>
<td>Dual SIM</td>
<td></td>
</tr>
</tbody>
</table>

Source: zol.com.cn; 360buy.com
NETWORK PERFORMANCE IS KEY TO SMARTPHONE EXPERIENCE

Great potential for operators to generate competitive advantage through network performance improvement.

Which are the main contributors to the problem?

- Slow mobile (3G) network: 47%
- Poor outdoor coverage: 30%
- Slow app: 26%
- Bug in the app: 25%
- Poor coverage at home: 23%
- Low memory on your phone: 17%
- Smartphone is too slow: 18%
- Poor WiFi connection: 17%
- Too many apps running on the phone: 14%
- Too many users in the same place: 13%
- Too many trying to access the same service: 14%
- Quality of the smartphone: 11%

Source: Ericsson ConsumerLab 2012

Do you experience issues with your smartphone?

- Yes: 87%
- No: 13%
Technology to Support Future MBB Growth - HSPA Evolution

End user experience

Spectrum efficiency gain

Aggregation gain

Combination

MIMO (multiple-input-multiple-output)

Multi-carrier

15 codes, 64QAM (higher order modulation)

10 codes, 16QAM

7.2 Mbps

21

42

84

168

...
TECHNOLOGY TO SUPPORT FUTURE MBB GROWTH
- LTE ADVANCED 3GPP REL 10 & BEYOND

100 MHz bandwidth: Up to 3.0 Gbps DL / 1.5 Gbps UL
HETEROGENEOUS NETWORK TO MEET CAPACITY DEMAND

- Required Capacity
- Add small cells + Densify macro
- Improve macro

Current Capacity

SEAMLESS USER EXPERIENCE - EVERYWHERE

Densify macro

Add small cells + network integrated Wifi

Quality of Service
NETWORK INTEGRATED WIFI SOLUTION
Select the right spectrum bouquet for future business offerings

Typical considerations:

1. **Coverage bands** – is fundamental (low frequency)
2. **Capacity bands** – to satisfy the large majority of consumers (medium frequency)
3. **Peak performance bands** – for the demanding peak data rate traffic requirements (high frequency)
4. **Dynamic traffic bands** – to provide for different and changing traffic patterns in hot-spots (unpaired)

Example 1
- 900 MHz or 850 MHz FDD
- 1800 MHz FDD
- 2100 MHz FDD
- 2500 MHz LTE FDD

Example 2
- 700 MHz or 800 MHz FDD
- 850 MHz or 900 MHz FDD
- 2100 MHz FDD
- 2300 MHz LTE TDD

Good combination of both frequency bands and access schemes is important
“Chinese Railway Uses Wi-Fi Spectrum for Signalling - with Predictable Results”

“The band is used by Wi-Fi hotspots, which are now interfering with its signalling network and shutting down the railways.”
SUMMARY

› In five years, 90% of the world’s population will be covered by mobile broadband through HSPA or LTE

› Heterogenous Networks will provide seamless user experience everywhere for future capacity demands

› For competitive business offerings, a “bouquet” of spectrum bands is required